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ES/9000 Reference guide

A new range in computing

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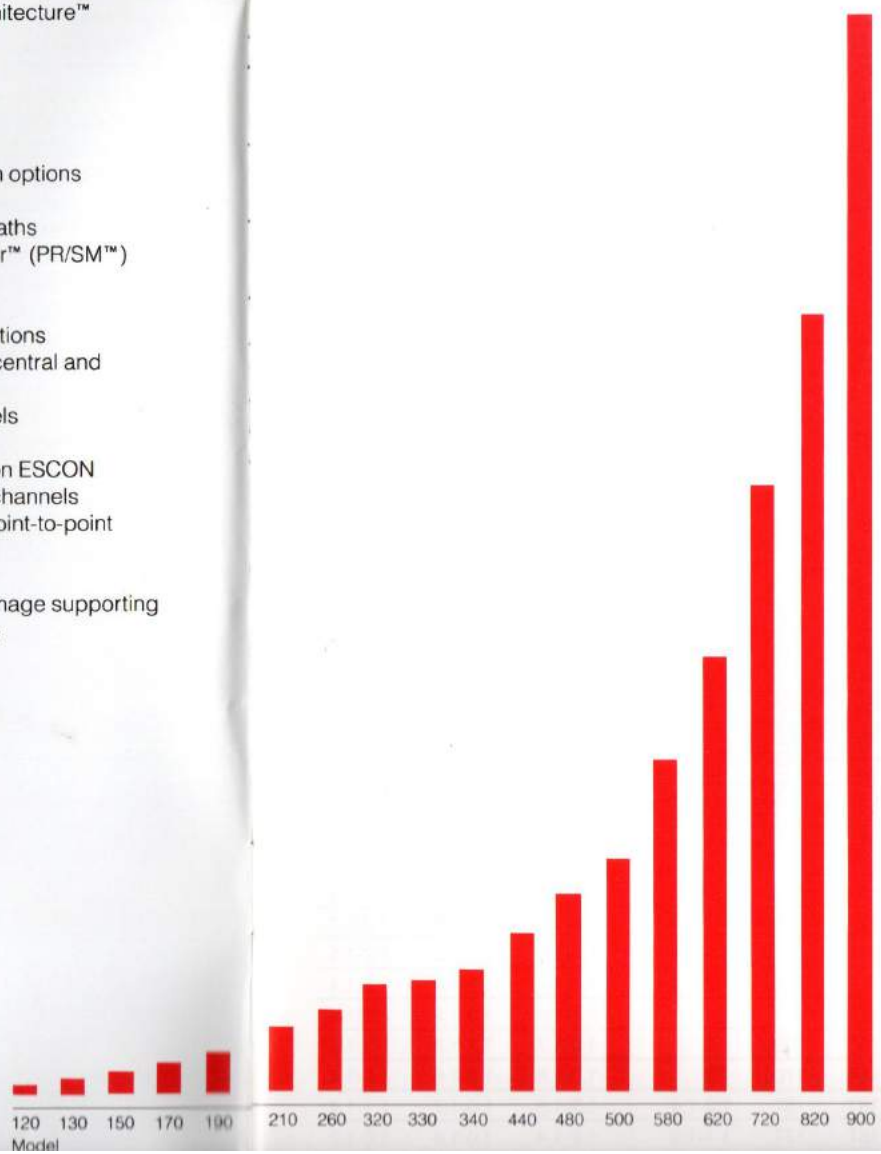
IBM Enterprise System/9000 Models

- A family of processors with common architecture, system software, applications, channel I/O, and operational environment
- Enterprise Systems Architecture/390™ (ESA/390™)
  - Architecture for the 1990s
- Architectural leadership with significant new extensions
  - Enterprise Systems Connection Architecture™ (ESCON™)
  - Sysplex Timer
  - Integrated Cryptographic Feature
  - DB2™ sort enhancement
  - VM data spaces
- Family of processors with many growth options
  - Extensive granularity
  - Numerous upgrade and migration paths
- Processor Resource/Systems Manager™ (PR/SM™) standard on all models
- Move-page facility
- Multisystem-complex management options
- Up to 9,216MB of processor storage (central and expanded)
- Up to 256 parallel and ESCON channels
- Up to six integrated Vector Facilities
- Data transfer rate of up to 10MB/sec. on ESCON channels and 4.5MB/sec. on parallel channels
- New channel architecture providing point-to-point connectivity up to a maximum of 9 Km
- Asymmetric configuration options
- World's most powerful single system image supporting IBM's Enterprise Systems Architecture



IBM ES/9000 upgrade performance[1] comparison (ITR)

Model			
To	From	VSE	VM/SP
130	9370-50	2.1	2.0
130	9370-60	2.7	2.3
130	120	1.7	1.6
150	9370-50	3.1	3.0
150	9370-60	4.0	3.4
150	9370-80	2.5	2.3
150	9370-90	1.8	1.7
150	130	1.5	1.4
170	9370-90	2.4	2.1
170	150	1.3	1.2

Model			
To	From	MVS/ESA	SEAP
210	170	1.8-2.2	1.9-2.2
260	170	2.5-2.9	2.0-2.2

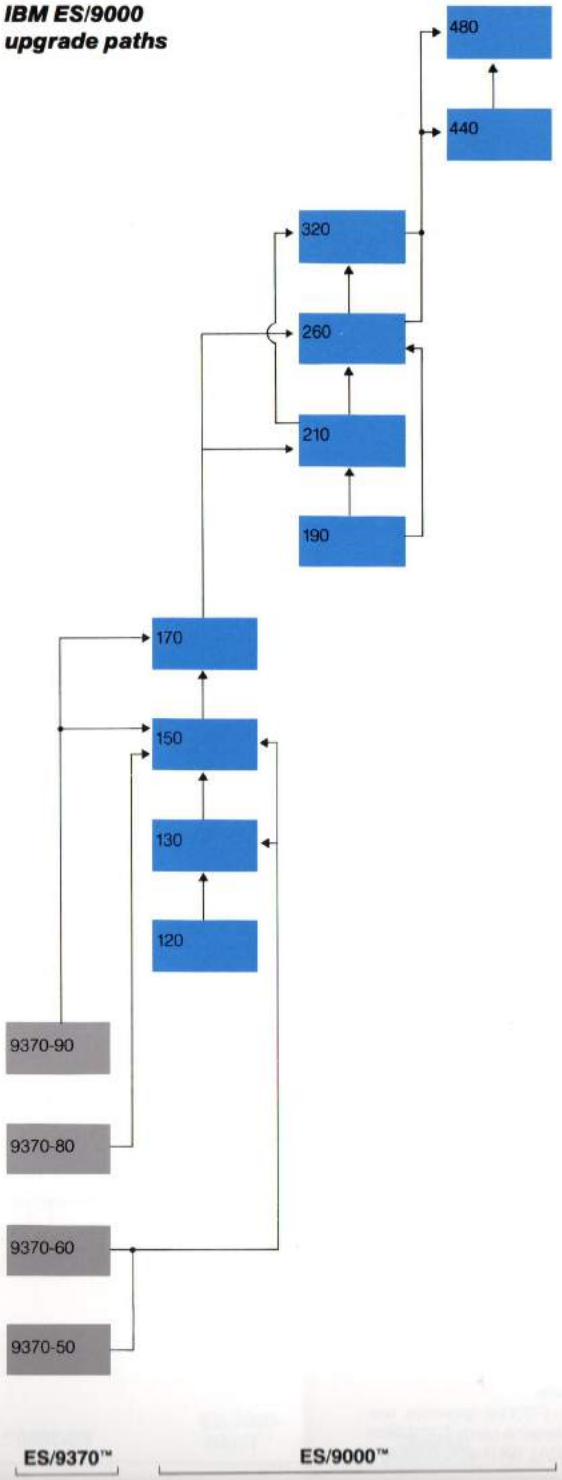
Model				SEAP (NIC)	
To	From	VM/XA	MVS/ESA	Scalar	Vector
210	190	1.2-1.3	1.4-1.6	1.0-1.6	1.1-1.8
260	190	1.5-1.6	1.7-2.2	1.1-2.1	1.2-2.2
260	210	1.2	1.2-1.4	1.0-1.3	1.0-1.3
320	210	1.4	1.3-1.9	1.0-1.6	1.1-1.5
320	260	1.2	1.1-1.4	1.0-1.3	1.0-1.3
440	320	1.6	1.3-1.7	1.8-1.9	1.6-1.9
440	260	1.9-2.0	1.8-1.9	2.0-2.0	1.8-2.0
480	260	2.3	2.2-2.6	2.0-2.2	2.0-2.1
480	320	1.9-2.0	1.8-1.9	2.0	1.8-2.0
480	440	1.2	1.1-1.4	1.0-1.1	1.0-1.1
15T	110J	1.9-2.1	1.9-2.0	2.3-3.0	1.4-2.0
15T	120E	1.9-2.1	1.9-2.0	2.3-3.0	1.4-2.0
15T	120S	1.9-2.1	1.9-2.0	2.3-3.0	1.4-2.0
15T	120J	1.6-1.8	1.5-1.6	1.9-2.7	1.2-1.9
17T	150E	1.7-1.9	1.6-1.8	1.3-1.6	1.3-1.7
17T	150S	1.3-1.4	1.4-1.6	1.2-1.6	1.2-1.5
17T	150J	1.2-1.3	1.3-1.4	1.2-1.4	1.2-1.4
17T	15T	1.1	1.1-1.2	1.0-1.2	1.0-1.2
18T	170S	1.3	1.4-1.7	1.2-1.8	1.3-1.5
18T	170J	1.3	1.3-1.5	1.2-1.6	1.2-1.4
18T	15T	1.2-1.4	1.3-1.8	1.0-1.7	1.1-1.4
18T	17T	1.1-1.2	1.2-1.4	1.0-1.4	1.0-1.2
25T	150E	2.9-3.3	2.5-3.0	2.4-3.2	2.1-2.7
25T	150S	2.2-2.4	2.4	2.4-2.5	2.3-2.6
25T	150J	2.1-2.2	2.0-2.2	2.3-2.4	2.2-2.5
25T	15T	1.9	1.8-2.0	1.9-2.0	1.9-2.0
28T	250S	1.5	1.6-2.1	1.4-1.7	1.5-1.9
28T	250J	1.4	1.5-1.9	1.2-1.5	1.4-1.7
28T	25T	1.3	1.3-1.7	1.1-1.2	1.1-1.4
330	15T	1.2	1.2-1.6	1.0-1.4	1.1-1.3
330	17T	1.0-1.1	1.1-1.2	1.0-1.1	1.0-1.1
500	180J	1.8-2.0	1.9	2.0	1.9-2.0
500	18T	1.8-2.0	1.9	2.0	1.9-2.0
500	330	2.0-2.1	2.0-2.2	2.0-2.1	2.0-2.1
500	340	1.8-2.0	1.9	2.0	1.9-2.0
580	200J	1.5-1.6	1.4	1.5	1.3-1.5
580	500	1.5-1.6	1.4	1.5	1.3-1.5
620	200J	2.0-2.1	1.8-1.9	1.9-2.0	1.7-2.0
620	280J	2.0-2.1	1.8-1.9	2.0	1.8-2.0
620	28T	2.0-2.1	1.8-1.9	2.0	1.8-2.0
620	500	2.0-2.1	1.8-1.9	1.9-2.0	1.7-2.0
620	580	1.3	1.3	1.3	1.2-1.3
720	300J	1.9	1.7-1.9	1.9-2.0	1.6-2.0
720	580	1.9	1.7-1.9	1.9-2.0	1.6-2.0
720	400J	1.4	1.3-1.4	1.5	1.3-1.5
720	620	1.4	1.3-1.4	1.5	1.3-1.5
720	500J	1.2	1.1-1.2	1.2	1.1-1.2
720	600J	1.0	1.0	1.0	1.0
820	620	1.7-1.9	1.7-1.9	2.0-2.7	2.0-2.8
900	720	1.7-1.9	1.7-1.9	2.0-2.7	2.0-2.8

[1]Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmark workloads in a laboratory environment with VM/SP 5, VSE 4.1, MVS/SP 3.1.3 and VM/XA SP 2.1. The VM/SP and VSE operating systems are limited to utilizing 16MB of processor storage.

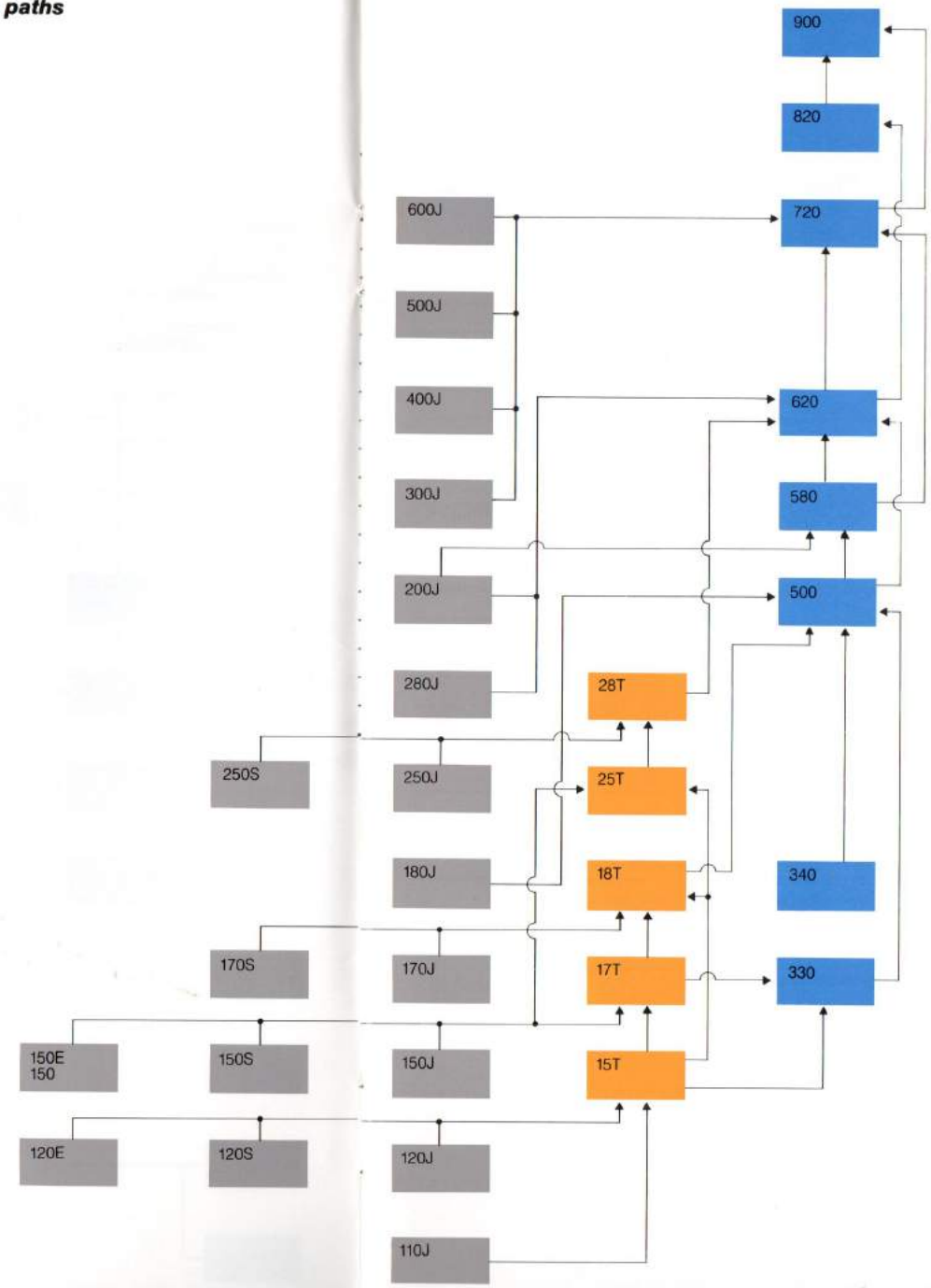
IBM ES/9000 Models

Models	
120, 130, 150, and 170	Air-cooled uniprocessors (Rack)
190, 210, 260, and 320	Air-cooled uniprocessors (Frame)
440, 480	Air-cooled dyadic processors (Frame)
330, 340	Water-cooled uniprocessors (Frame)
500	Water-cooled dyadic processor (Frame)
580	Water-cooled triadic processor (Frame)
620, 820	Water-cooled four-way multiprocessors (Frame)
720, 900	Water-cooled six-way multiprocessors (Frame)

IBM ES/9000 upgrade paths



IBM ES/9000 upgrade paths



Note:
For ES/3090 upgrades, see reference cards G320-9895 (USA), GX11-6110 (EMEA).

IBM ES/9000 upgradability

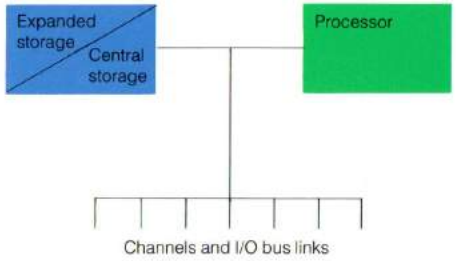
From	To
*9370-50	130, 150
*9370-60	130, 150
*9370-80	150
*9370-90	150, 170
120	130
130	150
150	170
*170	210, 260
190	210, 260
210	260, 320
260	320, 440, 480
320	440, 480
440	480
150	17T, 25T
120E	15T
150E	17T, 25T
120S	15T
150S	17T, 25T
170S	18T
250S	28T

From	To
110J	15T
120J	15T
150J	17T, 25T
170J	18T
250J	28T
180J	500
280J	620
200J	580, 620
300J	720
400J	720
500J	720
600J	720
15T	17T, 18T, 25T, 330
17T	18T, 330
18T	500
25T	28T
28T	620
330	500
340	500
500	580, 620
580	620, 720
620	720, 820[1]
720	900[1]
820	900

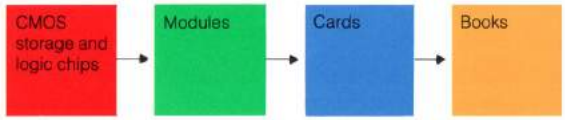
[1]Upgrades from 620 to 820 and from 720 to 900 involve substantial changes to the customer's existing processor.

*These upgrades involve substantial changes to the customer's existing system.

IBM ES/9000 design and technology
Models 120, 130, 150 and 170

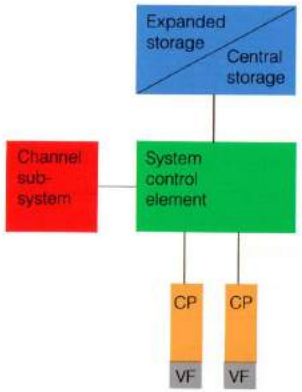


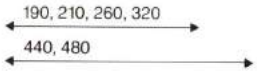
- Cards for processor, channel adapter, power/cooling regulators, universal power control, parallel/ESCON channels and I/O bus links.
- Book-card packaging (air-cooled)
- Cycle time from 30 to 38 nanoseconds



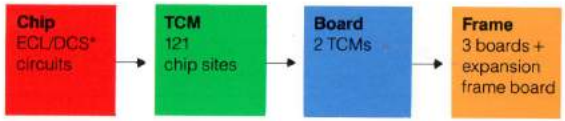
	Book logic	Processor storage
Type	CMOS	CMOS/DRAM
Chip capacity	–	1Mb/4Mb
Circuits per chip	40,000	–

IBM ES/9000 design and technology
Models 190, 210, 260, 320, 440 and 480





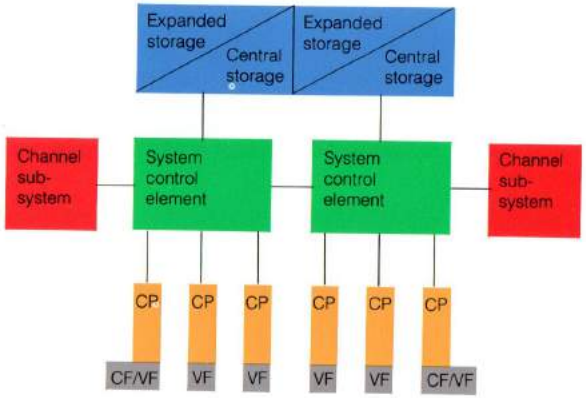
- Air-cooled Thermal Conduction Module (TCM)
- Multilayer ceramic substrate (63 layers)
- 2 TCMs per board
- Cycle time of 15 nanoseconds
- New logic and array chips

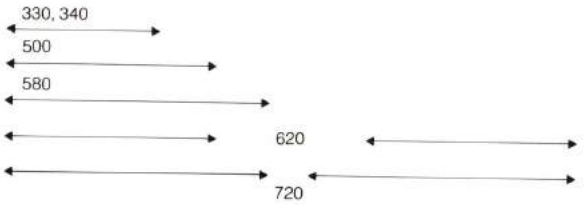


	TCM logic	Processor storage	High-speed buffer	Processor WCS
Type	Bipolar	CMOS/ DRAM	CMOS	CMOS
Chip capacity	–	1Mb and 4Mb	128 Kb	128Kb
Circuits per chip	*	–	–	–

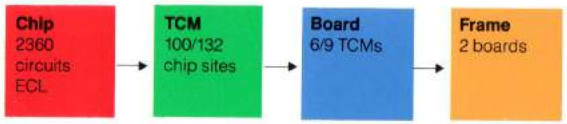
*ECL up to 5,200, DCS up to 2,600 circuits (less in combination)

IBM ES/9000 design and technology
Models 330, 340, 500, 580, 620 and 720

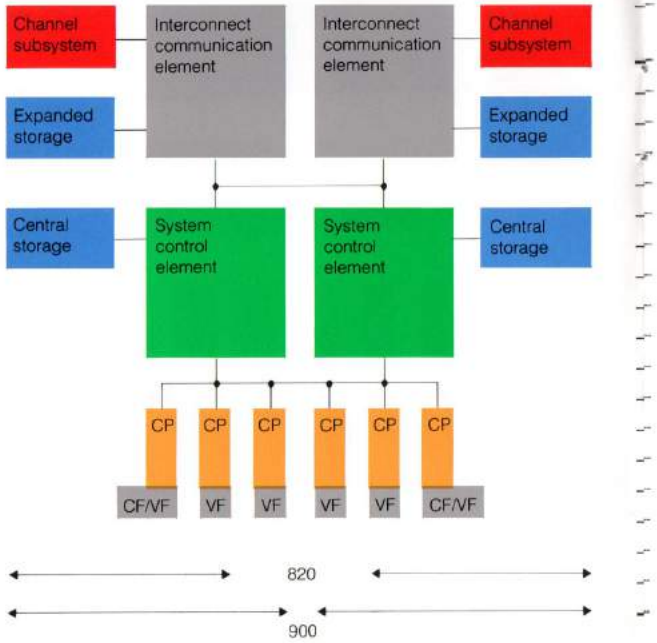


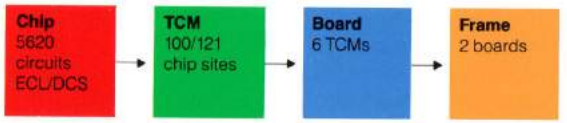


- Thermal Conduction Module (TCM)
- Multilayer ceramic substrate (38 layers)
- 6/9 TCMs per board
- Cycle time of 14.5 to 15 nanoseconds



	TCM logic	Processor storage CS	Processor storage ES	High-speed buffer	Processor WCS
Type	Bipolar	CMOS/ DRAM	CMOS/ DRAM	Bipolar	Bipolar
Chip capacity	–	1Mb	1Mb/4Mb	16 Kb	32 Kb
Circuits per chip	2,360	–	–	–	–





	TCM logic	Processor storage		High-speed buffer		Processor WCS
		CS	ES	Level 1	Level 2	
Type	Bi-polar	CMOS/ DRAM	CMOS/ DRAM	Bi-polar	Bi-polar	Bi-polar
Chip capacity	–	4Mb	1Mb/ 4Mb	32 Kb	64 Kb	64 Kb
Circuits per chip	5,620	–	–			

- New Thermal Conduction Module with enhanced cooling
- Multilayer glass ceramic substrate (63 layers)
- 6 TCMs per board
- New logic and array chips

IBM Enterprise Systems Architecture/390 (ESA/390)

See also ES/9000 software support chart

- The architecture for:
  - Processing increasing amounts of data
  - Avoiding constraints to further growth
  - Maximizing system efficiency through use of expanded storage
- ESA/390 is the architectural base for the 1990s:
  - Supported by all ES/9000 models
  - Supported by VSE/ESA, VM/ESA and MVS/ESA

VSE/ESA

- Runs on all ES/9000 models
- Offers high degree of affinity and cooperation with MVS/ESA
- Provides a strategic platform for remote unattended systems
- Dramatically improves capacity using larger real memory, new dynamic partitions, more channels and more address spaces

VM/ESA

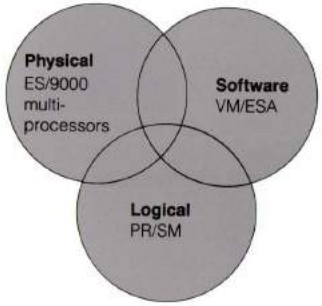
- Runs on all IBM ES/9000 models
- A single VM for the ESA/390 architecture
- Offers 31-bit addressing capability
- Provides VM data spaces used by SFS and SQL/DS for increased performance
- Provides system-managed storage using DFSMS™/VM
- Facilitates cooperative processing by increased synergy with intelligent workstations
- Supports a wide range of guest operating systems
- Supports ESCON architecture

MVS/ESA

(MVS/ESA SP V4 and MVS/DFP™ V3)

- Runs on all ES/9000 models
- Offers powerful addressing capability
- Uses multiple 2GB address and data spaces
- Provides less disruptive configuration changes (Dynamic Reconfiguration Management)
- Supports multisystem management through sysplex facilities
- Enhances SAA™ cooperative processing using APPC/MVS
- Provides system-managed storage with DFSMS
- Supports ESCON architecture

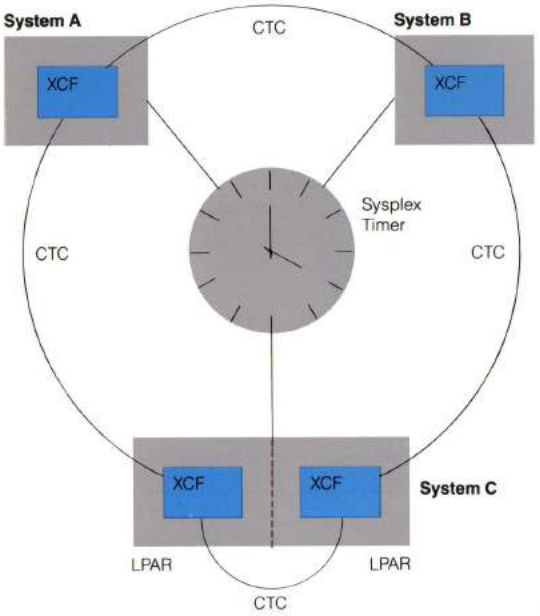
IBM ES/9000 multi-image management options



	Physical partitioning on MP models	Logical partitioning using PR/SM	Software partitioning using VM
Number of images	2	Up to 14 depending on model	Many
Processors	Dedicated	Dedicated or shared	Dedicated or shared
Storage	Dedicated	Dynamically reconfigurable	Dedicated or shared
Channels	Dedicated	Dynamically reconfigurable	Dedicated or shared

- PR/SM highlights:
  - CPU resource capping
  - ESCON support
  - Sysplex Timer support
  - Channel reconfiguration with a granularity of one channel
  - Storage reconfiguration with a granularity of one MB
  - Event-driven scheduling
  - Logical partition isolation
  - Integrated Cryptographic Feature support
  - Vector Facility support

IBM ES/9000 sysplex



XCF = Cross-system coupling facility
CTC = Channel-to-channel
LPAR = Logical partition

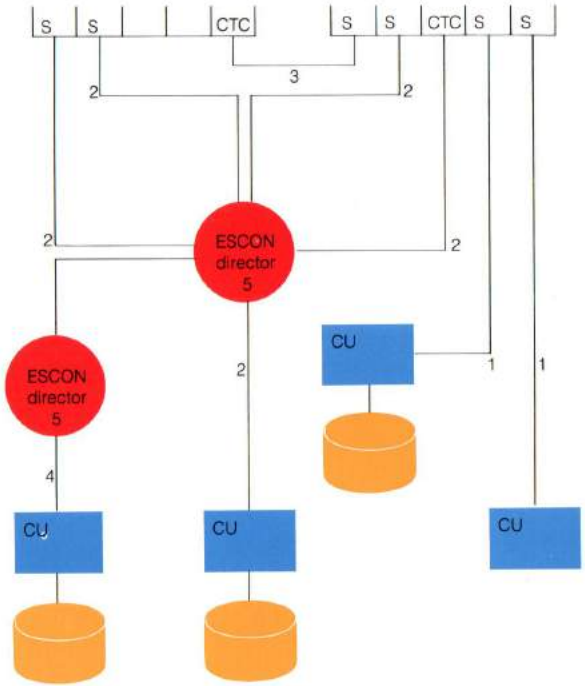
- Sysplex provides single point of control for multiple MVS/ESA SP V4 systems
- Maximum of 8 systems per sysplex
- Used by:
  - Global resource serialization
  - OPC/ESA
  - TSO/E broadcast
  - MVS/JES2 system consoles
  - TSO/E extended consoles

IBM ES/9000 expanded storage

- Optional extension of ES/9000 processor storage
- Up to 8,192MB
- Synchronous movement of 4K pages to or from central storage
- More flexible configurations through asymmetry
- Correction of single- and double-bit errors, detection of triple- and some multiple-bit errors on water-cooled models
- Correction of single-bit errors and detection of double-bit errors on air-cooled models

Used for:	VM/ESA	MVS/ESA
Paging	•	•
Data space	•	•
Data in memory	•	•
Hiperspace	Guest	•
Hipersorting	Guest	•
Hiperbatch	Guest	•
Minidisk caching	•	
Guest support	•	

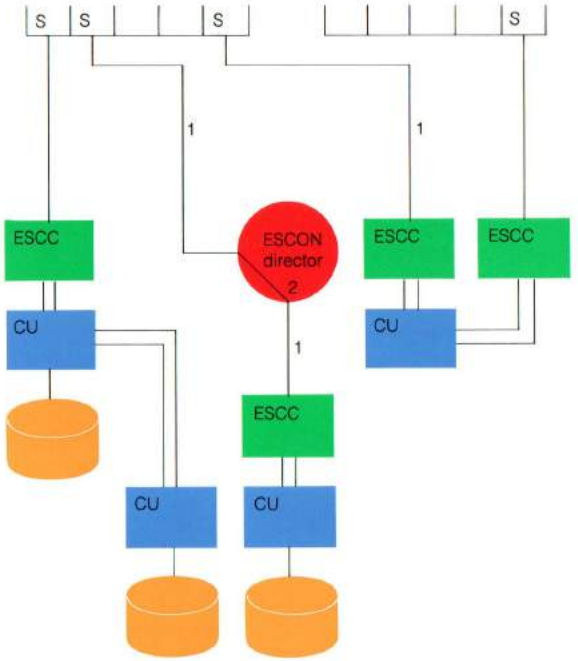
- Reduced response time
- Reduced I/Os
- Increased throughput
- Increased number of users



S = ESCON channel
CTC = Channel-to-channel
CU = Control unit

1. Distances up to 3 km for:
   – 3990-2* and 3*
   – 3490*
   – 3174*
   – 3172*
   – Up to 10 MB/sec. data transfer rate
2. Total distance for CTC or ESCON channel connection through one ESCON director – up to 6 km. Data transfer rate up to 10 MB/sec.
3. Distances for CTC connection up to 3 km. Data transfer rate up to 10 MB/sec.
4. Maximum of two ESCON directors allowing distances up to 9 km
5. Maximum of 60 ports available on an ESCON director permitting up to 30 concurrent data transfers

*Adapter may be required



S = ESCON channel
ESCC = ESCON converter
CU = Control unit

1. Distance dependent on device
   – 3880/3990-1 up to 0.9 km*
   – 3990-2, 3 up to 1.2 km*
   – Others up to 3 km
2. ESCON converter through an ESCON director must be a static (connection) path

*Deduct 200 m when attached through an ESCON director.

IBM ES/9000 Integrated Cryptographic Feature

- An optional, integrated feature on ES/9000 models 330, 340, 500-900
- Provides high-speed data encryption
- Participates in IBM's security architecture
- Runs at processor speeds
- Supports PR/SM with separate master keys for up to seven partitions per side
- Requires MVS/ESA and Integrated Cryptographic Service Facility/MVS (ICSF/MVS)
- Tamper resistant physical packaging
- Compatible with selected IBM encryption products
- Maximum of one Integrated Cryptographic Feature (ICRF) per side
- Mutually exclusive with the Vector Facility on the same CP

IBM ES/9000 integrated Vector Facility

Hardware/architecture
- Optional integrated extension to each central processor (on models 190, 210, 260, 320, 330, 340, 440, 480, 500, 580, 620, 720, 820, and 900)
- Mutually exclusive with one Integrated Cryptographic Feature on the same CP (selected models)
- Incremental investment: up to six vector facilities are available (selected models)
- 256 element section size
- Growing number of enabled applications are available in the areas of seismic analysis, structures, fluids, computational chemistry, operations research, and others*

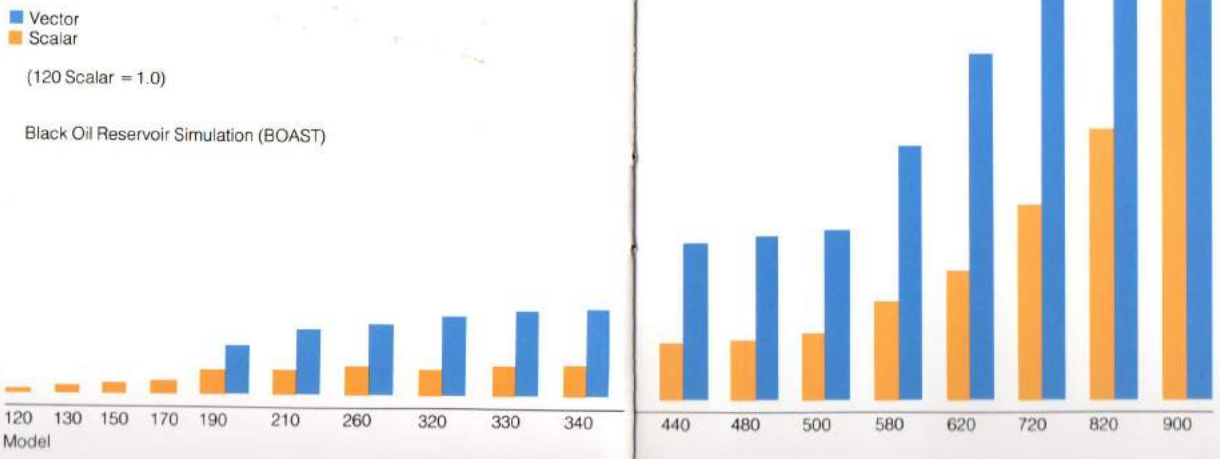
VM support
- VM/ESA Rel. 1.0 and Rel. 1.1
- VM/XA SP 2.1
- VM/HPO Rel. 5 and 6 (in LPAR mode)
- AIX®/370 (under VM)

MVS support
- MVS/ESA SP V4
- MVS/SP V3
- MVS/SP V2
- RMF for vector statistics
- Data in virtual for selected data sets

Application support
- VS FORTRAN V2.1 (parallel FORTRAN-PRPQ)
- VS FORTRAN V2.3, 2.4, 2.5:
  - Automatic vectorizing capabilities
  - Interactive vectorization aid
  - Multitasking facility for multiple processor execution of a single job
  - FORTRAN translation tool
  - IBM FORTRAN conversion program
  - Assembler H Version 2.1
  - Engineering and Scientific Subroutine Library (ESSL)
  - Optimization Subroutine Library (OSL)
  - APL2 direct support of Vector Facility
  - Mathematical Programming System Extended/370 (MPSX/370) Vector Facility support
  - SCENAD: full-screen menus, ISPF support

*See Catalog of Engineering and Scientific Application Programs, G320-6739.

SEAP internal throughput comparison



IBM ES/9000 processor options

Model	Processor storage (MB)			Central storage (MB)			Expanded storage (MB)		
	Min.	Max.	Incr.	Min.	Max.	Incr.	Min.	Max.	Incr.
120	16	256[1]	16[2]	16	256	*	0	240	*
130	16	256[1]	16[2]	16	256	*	0	240	*
150	16	256[1]	16[2]	16	256	*	0	240	*
170	32	256[1]	32[2]	16	256	*	0	240	*
190	64	512	64[13]	32	128	*	0	480	*
210	64	1,024	64[3]	32	256	*	0	992	*
260	64	1,024	64[3]	32	256	*	0	992	*
320	64	1,024	64[3]	32	256	*	0	992	*
440	128	1,024	128[4]	32	256	*	0	992	*
480	128	1,024	128[4]	32	256	*	0	992	*
330	32	640	–	32	128	32	0	512	64[8]
340	32	1,152	–	32	128	32	0	1,024	64[9]
500	64	2,304	–	64	256	64[5]	0	2,048	64[10]
580	64	2,304	–	64	256	64[5]	0	2,048	64[10]
620	128	4,608	–	128	512	64[6]	0	4,096	64[11]
720	128	4,608	–	128	512	64[6]	0	4,096	64[11]
820	256	9,216	–	256	1,024	128[7]	0	8,192	256[12]
900	512	9,216	–	512	1,024	256[14]	0	8,192	256[12]

[1] 128 if integrated I/O installed
[2] 16 up to 32; 32 up to 128; 64 up to 256
[3] 64 up to 128; 128 up to 256; 256 up to 512, 512 up to 1,024
[4] 128 up to 256; 256 up to 512; 512 up to 1,024
[5] 64 up to 128; 128 up to 256
[6] 64 up to 128; 128 up to 256 per side
[7] 128 up to 256; 256 up to 512 per side
[8] 64 up to 256; 256 up to 512
[9] 64 up to 256; 256 up to 512; 512 up to 1,024
[10] 64 up to 256; 256 up to 512; 512 up to 2,096
[11] 64 up to 256; 256 up to 512; 512 up to 2,096 per side
[12] 256 up to 512; 512 up to 2,096; 1,024 up to 4,096 per side
[13] 64 up to 128; 128 up to 256; 256 up to 512
[14] Per side

*Granularity of central storage and expanded storage at system intialization is model dependent
– = Not applicable

IBM ES/9000 processor options

Model	Total channels		Parallel channels			ESCON channels			Integrated I/O Buses		
	Min.	Max.	Min.	Max.	Incr.	Min.	Max.	Incr.	Min.	Max.	Incr.
120	0	12	0	12	1 or 3	0	12	1 or 3	0	4	2
130	0	12	0	12	1 or 3	0	12	1 or 3	0	4	2
150	0	12	0	12	1 or 3	0	12	1 or 3	0	6	2
170	0	24	0	24	1 or 3	0	24	1 or 3	0	6	2
190	8	32	8	24	4	0	20	4			
210	8	48	8	48	4	0	36	4			
260	12	48	12	48	4	0	36	4			
320	12	48	12	48	4	0	36	4			
440	12	48	12	48	4	0	36	4			
480	12	48	12	48	4	0	36	4			
330	16	64	16	32	16	0	32	16			
340	16	64	16	32	16	0	32	16			
500	32	64	32	64	16	0	32	16			
580	32	64	32	64	16	0	32	16			
620	64	128	64	128	16†	0	64	16†			
720	64	128	64	128	16†	0	64	16†			
820	128	256	0	96	16†	32	256	16†			
900	128	256	0	96	16†	32	256	16†			

†Per side

IBM ES/9000 processor options

Model	Vector Facility			Integrated Cryptographic Feature			Logical partitions
	Min.	Max.	Incr.	Min.	Max.	Incr.	Max.
120	–	–	–	–	–	–	4
130	–	–	–	–	–	–	4
150	–	–	–	–	–	–	4
170	–	–	–	–	–	–	4
190	–	1	1	–	–	–	7
210	0	1	1	–	–	–	7
260	0	1	1	–	–	–	7
320	0	1	1	–	–	–	7
440	0	2	1	–	–	–	7
480	0	2	1	–	–	–	7
330	0	1	1	0	1[1]	1	7
340	0	1	1	0	1[1]	1	7
500	0	2	1	0	1[1]	1	7
580	0	3	1	0	1[1]	1	7
620	0	4	1	0	2[2]	1	7/14
720	0	6	1	0	2[2]	1	7/14
820	0	4	1	0	2[2]	1	7/14
900	0	6	1	0	2[2]	1	7/14

[1] Mutually exclusive with one Vector Facility
[2] Maximum one Integrated Cryptographic Feature per side and mutually exclusive with one Vector Facility on the same CP
– = Not applicable

IBM ES/9000 processor support units

Model	Processor controller element	Power and coolant distrib. unit	Display stations	Tape streamer	Modem
120	PS/2® Model 70[1]	–	1[3]	1	1
130	PS/2 Model 70[1]	–	1[3]	1	1
150	PS/2 Model 70[1]	–	1[3]	1	1
170	PS/2 Model 70[1]	–	1[3]	1	1
190	I/O Support Processor[1]	–	1-5	1	1
210	I/O Support Processor[1]	–	1-5	1	1
260	I/O Support Processor[1]	–	1-5	1	1
320	I/O Support Processor[1]	–	1-5	1	1
440	I/O Support Processor[1]	–	1-5	1	1
480	I/O Support Processor[1]	–	1-5	1	1
330	9022	1	2-5[2]	–	1
340	9022	1	2-5[2]	–	1
500	9022	1	2-5[2]	–	1
580	9022	1	2-5[2]	–	1
620	9022	2	3-6[2]	–	2
720	9022	2	3-6[2]	–	2
820	9022	2	3-6[2]	–	2
900	9022	2	3-6[2]	–	2

[1]Shipped preconfigured with the system
[2]3206 Model 100
[3]Alternate and remote consoles are available
– = Not applicable

*IBM ES/9000 hardware features**

	120-170	190-260, 320, 440-480	330, 340 500-900
ESA/390 Architecture	S	S	S
PR/SM	S	S	S
ESCON channels	O	O	O[1] S[2]
4.5MB parallel channels	O	S	O[2] S[1]
Sysplex Timer	O[3]	O	O
Vector Facility	–	O	O
Integrated Cryptographic Feature	–	–	O
SIE Assist	–	S	S
DB2 sort enhancement	–	S	S
VM data spaces	S	S	S
Dynamic Reconfiguration Management	–	S	S
Enhanced power system	–	–	S
Console integration	S	S	S
Integrated I/O features	O	–	–
Integrated communications subsystems	O	–	–
Rack-mounted MCCU	O	–	–
Battery backup	S	–	–

[1]Models 330, 340, 500-720
[2]Models 820, 900
[3]Model 170
*Specific software levels may be required

S = Standard feature
O = Optional feature
– = Not applicable

IBM ES/9000 software support

	Models 120-170			Models 190-900	
IML Mode:	ESA/ 390	LPAR	S/370	ESA/ 390	LPAR
VSE					
VSE/ESA V1.1	●	●	●	*	●
VSE/SP V4.1.2	–	●	●	–	●
VSE/SP V3.2.2	–	●	●	–	●
VM					
VM/ESA					
370 feature	–	●	●	–	●
ESA feature Rel. 1.0	●	●	–	●	●
ESA feature Rel. 1.1	●	●	–	●	●
VM/XA SP R2.1	–	●	–	●	●
VM/HPO R5, R6	–	–	–	–	●
VM/SP R5, R6	–	●	●	–	●
MVS					
MVS/ESA SP V4.1.0, V4.2.0	●	●	–	●	●
MVS/SP V3.1.0e, V3.1.3	●	●	–	●	●
MVS/SP V2.2.0, V2.2.3	●	●	–	●	●
MVS/SP V1.3.5	–	●	●	–	●
AIX (under VM)					
AIX/370 V1.2	–	–	–	●[1]	●[2]
MUSIC					
MUSIC/SP V2.2	●[1]	●	●	●[1]	●
TPF					
TPF 3.1	–	–	–	●[4]	●[3]
DPPX					
DPPX/370 V1.2	–	–	●	–	–
DPPX/370 V1.3	●	●	●	–	–

[1]VM/ESA only
[2]Any supported VM level
[3]Single system environment: Models 190-320 and Models 440 and 480
[4]820 & 900 in physical partition mode
330, 340, 500-900 in loosely coupled environment
*Uniprocessor models 190, 210, 260 and 320
– = *Not applicable*

Note:
A growing number of enabled applications are available in the areas of cooperative processing, performance monitoring, connectivity, industry specific solutions, and others. (See your IBM representative for current information).

*IBM ES/9000 physical characteristics**

	120		130		150		170		190	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Acoustics, Bels		6.5		6.5		6.5		6.5		7.2
Power consumption 50/60Hz, KVA	0.6	1.4	0.6	1.4	0.6	1.4	0.6	1.4		7.4
Heat output, KBTU/hr Total air	1.7	3.8	1.7	3.8	1.7	3.8	1.7	3.8	14.1	18.5
Floor space**										
Sq. feet		6.48		6.48		6.48		6.48	14.7	14.7
Sq. meters		0.6		0.6		0.6		0.6	1.37	1.37
Including service clearance**										
Sq. feet		86		86		86		86	96.6	96.6
Sq. meters		8		8		8		8	9.0	9.0
Approximate weight**										
Lbs.		187		187		187		187	1865	2000
Kg		85		85		85		85	839	906

	210		260		320		440		480	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Acoustics, Bels		7.2		7.2		7.2		7.2		7.2
Power consumption 50/60Hz, KVA		7.6		7.9		8.0		11.6		11.6
Heat output, KBTU/hr Total air	14.1	19.0	14.6	19.5	14.6	19.8	21.2	28.7	21.2	28.7
Floor space										
Sq. feet	14.7	15.6	14.7	15.6	14.7	15.6	14.7	15.6	14.7	15.6
Sq. meters	1.37	1.53	1.37	1.53	1.37	1.53	1.37	1.53	1.37	1.53
Including service clearance										
Sq. feet	96.6	125.2	96.6	125.2	96.6	125.2	96.6	125.2	96.6	125.2
Sq. meters	9.0	11.5	9.0	11.5	9.0	11.5	9.0	11.5	9.0	11.5
Approximate weight										
Lbs.	1865	2765	1865	2765	1865	2765	2000	2900	2000	2900
Kg	839	1248	839	1248	839	1248	906	1315	906	1315

*Specifications are subject to change without notice
**Processor rack only; Models 120, 130, 150, 170

continued on next page

*IBM ES/9000 physical characteristics**

	330		340		500		580	
	Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
Acoustics, Bels		7.8		7.8		7.8		7.8
Power consumption, 50/60Hz, KVA	32.1	38.4	32.1	38.8	40.6	49.4	48.1	57.4
Heat output, KBTU/hr								
To water	56.0	68.9	56.0	68.9	76.1	95.9	95.6	120.5
To air	18.8	40.6	18.8	40.6	35.5	44.0	37.9	47.1
Total	74.8	109.5	74.8	109.5	111.6	139.9	133.5	167.6
Floor space								
Sq. feet	82.4	88.4	82.4	99.1	82.4	99.1	93.3	99.1
Sq. meters	7.7	8.2	7.7	9.2	7.7	9.2	8.7	9.2
Including service clearance								
Sq. feet	440.7	461.7	440.7	497.1	440.7	497.1	476.3	497.1
Sq. meters	40.9	42.9	40.9	46.2	40.9	46.2	44.3	46.2
Approximate weight								
Lbs.	10985	12780	10985	12780	11925	13710	13085	13710
Kg	4983	5797	4983	5797	5409	6219	5935	6219

	620		720		820		900	
	Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
Acoustics, Bels		8.1		8.1		8.1		8.1
Power consumption, 50/60Hz, KVA	77.2	92.8	92.2	111.2	108.6	138.6	126.6	165.8
Heat output, KBTU/hr								
To water	152.2	191.8	191.2	241.0	224.6	305.2	272.4	377.4
To air	58.0	75.0	62.8	81.2	63.4	85.4	73.0	97.0
Total	210.2	266.8	254.0	322.2	288.0	390.6	345.4	474.4
Floor space								
Sq. feet	152.6	186.9	178.0	186.9	159.3	159.3	181.2	181.2
Sq. meters	14.2	17.4	16.5	17.4	14.8	14.8	16.8	16.8
Including service clearance								
Sq. feet	720.0	834.1	791.4	834.1	728.1	728.1	799.5	799.5
Sq. meters	66.9	77.5	73.5	77.5	67.6	67.6	74.3	74.3
Approximate weight								
Lbs.	22295	24625	24625	27635	23179	25203	25823	27847
Kg	10113	11170	11170	12535	10514	11432	11455	12631

*Specifications are subject to change without notice

Glossary of acronyms

APPC:	Advanced program-to-program communication
CF:	Cryptographic feature
CMOS:	Complementary metal oxide semiconductor
CP:	Central processor
CTC:	Channel-to-channel communication
CU:	Control unit
DCS:	Differential Current Switch
DRAM:	Dynamic random access memory
ECL:	Emitter Coupled Logic
ESA:	Enterprise Systems Architecture
ESCON:	Enterprise Systems Connection Architecture
IML:	Initial Machine Load
ISPF:	Interactive systems programming facility
LPAR:	Logical partition
PR/SM:	Processor Resource/Systems Manager
SCE:	System control element
SEAP:	Scientific Engineering Application Program
TCM:	Thermal Conduction Module
VF:	Vector Facility
WCS:	Writeable Control Store